# THE REPORT AND OPINION OF JOHN SMITH, Engineer,

CONCERNING

The preſent State of the DRAINAGE of the Low Lands
on both Sides the River WITHAM, from the City of
LINCOLN, through BOSTON to the SEA, &c.

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# THE
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Of the preſent State of the Drainage of the Low Lands on both Sides the River WITHAM. from the City of LINCOLN through BOSTON to the Sea. And alſo how far a compleat Drainage is or can be performed by the Powers given in the preſent Act of Parliament, together with my Obſervations on the Plan and Eſtimate drawn by Mr. Creaſſy, for effecting the Purpoſes of a General Drainage of this extenſive Country. Likewiſe ſuch Improvements and Additions as I apprehend will be neceſſary for effecting all the Purpoſes above mentioned.

AGREEABLE to the Reſolutions of the Commiſſioners, and in Company with Mr. *Creaſſy*, I began at the Junction of the River *Witham* with the Sea, and viewed and examined the whole Courſe of it from thence to the City of *Lincoln*, as alſo of all the Rivers, Rivulets, Brooks, and Waters, both on the Eaſt and Weſt Side of the River, that empty themſelves into it on either Side; alſo viewed and examined the Boundary preſcribed by the preſent Act of Parliament, and am clearly convinced as follows,

That as the Boundary and Principles preſcribed thereby, is not ſufficient to include all the Works of Drainage neceſſary for this extenſive Country, I do therefore recommend, that Application be made to Parliament for Powers to execute the Scheme herein after mentioned.

I join in Opinion with Mr. *Creaſſy*, that the running the Soakage and Downfall Waters in the ſame Channel or River with thoſe that come from the high Land, is an erroneous Method, although too often practiſed in Drainages during the Courſe of my Remembrance. I therefore recommend, that collateral or parallel Drains be made at a proper Diſtance from the Embankment to receive them, the Dimenſions of which will be pointed out hereafter.

The great Quantity of Water that is collected into the River *Witham* in the Winter Seaſon, muſt form itſelf into a Declivity ſufficient for its Paſſage to the Sea; and as the Banks of the River, in their preſent State, are not high enough for that Purpoſe, as alſo the Fall of the River too ſmall for that Operation, where ſuch a Situation happens by Nature, ſome Art muſt be uſed in performing ſuch a great Work as the Drainage of this Country. The uſual Method has been to widen and deepen the River or main Drain, but that Mode is liable to ſuch a Variety of Obſtructions by Silt, Sand, and Gravel being brought down by the adjoining Rivers, it ſeems impoſſible that ſuch a Method ſhould anſwer the deſired End; the Brooks and Rivulets, with a Rapidity much ſuperior to the River or main Drain, bring down the Gravel, &c. ſo large, that the Velocity of the Water in the River cannot carry it off, therefore it muſt of courſe ſubſide, and form itſelf into a Shoal, which now does, and always muſt occaſion a very great Obſtruction to the Drainage of this Country, immediately into the River or main Drain. The Floods, common to all Rivers, overflow the upper Part of the Country in ſuch a Manner, that no Drainage can be made into that Part of the River from the Lands adjoining or near thereto, within the Level. I find on examining the State of the River on both Sides from *Chappel-Hill* to *Lincoln*, that during the Winter Seaſon, the Water in the River is very ſeldom below the Surface of the adjoining Lands, therefore it does not require any great Skill in pointing out a Method of Draining this Country; every Man who has common Underſtanding, muſt conceive it reaſonable, that after the Flood Waters are prevented from overflowing the Country by Embankments, the Soakage and Downfall Waters muſt be conveyed to ſome Place in the River where there is a Fall ſufficient for them to run off, and until that is done, they muſt and will overſpread the whole Country.

The Plan laid down by Mr. *Creaſſy*, in his Report directed to the Noblemen and Gentlemen Commiſſioners, &c. I have examined, and I find that the principal Part of it is very well adapted for Draining the Country now under Conſideration; and ſuch Parts of it as appears to be uſeful I have copied, and accordingly begin at Page 3, as follows. To cut two

Drains parallel to the River *Witham*, from *Chappel Hill* to *Lincoln*, on each Side of the River, and to form the Earth ariſing therefrom into Banks, at a proper Diſtance from the River; the Drains to be Thirty Feet wide at the Top, Ten Feet wide at the Bottom, Seven Feet deep at the lower Ends, Twenty Feet wide at the Top, Eight Feet wide at the Bottom, and Five Feet deep at the upper Ends. Theſe Drains or Cuts will afford Earth ſufficient to make ſubſtantial Banks, and to be ſet at Fifty Feet from the River, ſo as to contain the Floods between them, till ſuch Time as the Water can be diſcharged by the Sea Sluice at *Boſton*.

I do alſo agree with Mr. *Creaſſy*, that the Rivulets, Brooks, and Becks running from the high Country on the Eaſt Side of the main River, to be embanked up to the high Lands by cutting Side Drains in the ſame Manner as before mentioned, ſo that the Waters coming from the Hills ſhall have no Communication whatſoever with the ſide Drains, until they come below *Chappel Hill*, where I do adviſe that all the Waters be united and conveyed down the New River and *Boſton* Haven to the Sea. And to give all the low Lands on the Eaſt Side the River an equal Advantage of Draining, I do adviſe that ſunken Tunnels or ſubterraneous Paſſages be laid under all the Rivulets, Brooks and Becks, that the Soakage and Downfall Waters may paſs freely down the ſide Drains. And in order to give all the Lands on the Weſt Side the ſame Advantage, I do propoſe that the *Car-dike* be ſcoured out, and the Earth ariſing from it to be formed into a Bank on the Fen Side, from the upper End of the low Lands, to be drained to *Billinghay Skirth*, ſo as to make the *Car-dike* a catch water Drain for all the Waters coming from the high Lands on the South Side, and to diſcharge the ſame into *Billinghay Skirth*, which I adviſe to be embanked by cutting ſide Drains in the ſame Manner as before propoſed, and to form the Banks at ſuch a ſufficient Diſtance as to be capable of diſcharging, as well the Waters of the ſaid *Billinghay Skirth*, as thoſe intended to be brought down the *Car-dike* or *Catch-water* Drain; and do alſo adviſe, that a ſunken Tunnel be laid under the Skirth to diſcharge all the Soakage and Downfall Waters that fall between *Lincoln* and the above Skirth, along the Side Drains, and that the whole of theſe Waters be conveyed below *Chappel Hill* without communicating with the high Land Waters.

By the Plan above mentioned, all the high Land Waters would be ſeparated and divided from thoſe of the low Lands, and be carried independant of each other until they come to the New River at *Chappel Hill*; and to render the New River more capable of diſcharging all thoſe united Waters, I adviſe the Clay Reach, called the *Round Houſe* Reach, to be made wider and deeper; theſe Reaches remain juſt as they were executed, although the other Parts, which are of a light Sand, are worn by the Rapidity of the Current much wider and deeper than they were firſt made; I am well convinced that if theſe Clay Reaches were made ſufficiently wide and deep, that the ſandy Parts would ſoon be worn anſwerable thereto, and be carried to Sea by the Force of the Current, provided theſe Works are done before the Weeds and other Vegetables grow and get compacted on the ſandy Parts, for if the Weeds and other Vegetables once lodge and grow at the Bottom and Sides thereof, they will prevent the Water from having that Effect.

The next Thing is, ------I ſhall ſay nothing reſpecting *Kyme Eau*, as I have recommended every Thing that I conceive neceſſary for anſwering the Purpoſes of Drainage, in my laſt Report of *Sleaford* Navigation, and I am ſorry to obſerve, that ſome fallacious and ill grounded Reports have cauſed that Undertaking to miſcarry, though it was to have been executed without coſting the Landed Intereſt one Farthing, and would have been of ſuch manifeſt Advantage both to the landed Gentlemen and Country in general, for many Miles round.

What Mr. *Creaſſy* has ſaid above about *Kyme Eau*, I apprehend was right at that Time, but as the *Sleaford* Navigation ſeems not in a Situation to get forward at preſent, it becomes neceſſary to form an Eſtimate of Embanking it, which will be done in its proper Place, in the ſame Manner as other Banks of that Size.

I agree with Mr. *Creaſſy*, that it appears to me that the Act ſufficiently provides for the effectually Draining the *Wildmore* and *Weſt* Fens, whenever the Diſtrict Commiſſioners ſhall agree to put it into Execution properly, and therefore I ſhall ſay nothing reſpecting that Matter at preſent; but ſhall now enumerate ſome of the many Advantages that will of courſe attend the adopting of the Plan here recommended; in the firſt Place, the low Lands will be rendered dry by carrying the Soakage and Downfall Waters to a lower Part of the Outfall in ſeparate and independant Channels, as they will be thereby diſcharging at the ſame Time the Flood Waters are running off, though with different Velocities. In the next Place, I conceive theſe Works will be done at a much leſs Expence than to ſcour out the River, &c. as directed by the Act, provided the Banks and other Works be made equally ſubſtantial. I have examined and ſounded the River all the Way from the *Grand Sluice* at *Boſton*, to *Lincoln*, and from a little above *Chappel Hill*, about two-thirds of the Way to *Lincoln*; the Bottom of the River is an exceeding hard Gravel mixed with Sand, which will coſt Seven Shillings per Floor digging, barrowing, and forming into Banks, which will be very indifferent when finiſhed; while the ſaid Cuts, being Earth and Clay, will be executed at Three Shillings per Floor at an Average, and will make much better Banks than the other. The next Thing I conſider is, that the Waterway will be increaſed more than double of what is intended by the preſent Act, and the Velocity of the high Land Water will not be leſſened, which of courſe will be the Caſe; if the River was deepened at the upper End, there will be a Foot leſs Fall to the *Grand Sluice*, and the Velocity of the Water at the Bottom will be decreaſed in Proportion.

The next Obſervation that occurs to me is, that the Water in the middle River will be held up to any reaſonable Height, even near to the Top of the Banks, without doing any Damage to adjoining low Lands, by a Staunch and Lock at the lower End, and by that Means be ſent to the extreme Parts of the Levels for the Uſe of Cattle in dry Seaſons, if proper Tunnels are laid through the Banks, which I conſider a Circumſtance of great Importance to every Proprietor of the low Lands. And thoſe little Diſputes which happen between the landed Intereſt and the Navigation, would entirely ſubſide, as the Drainage would be totally independant of the Navigation from *Lincoln* to the Junction of the Waters below *Chappel Hill*; and by deepening the Reaches before mentioned, in the New River, there will be no Occaſion to hold up the Water at the *Grand Sluice*, nor by Means of any Lock between there and the Junction of the forementioned Waters, for the Purpoſe of Navigation. Another Thing of no leſs Moment ſtrikes me, which is, that the Drains propoſed to convey the Soakage and Downfall Waters from off the low Lands, will not be liable to be choaked up by Sand, Gravel, or other Matter brought in by the high Land Rivulets, Brooks, and Becks, which have been found ſo detrimental to the Mother River, witneſs the Gravel brought down the *Bane*; and the Waters may be turned out of the Mother River down the ſide Cuts, at a proper Seaſon of the Year, till any Obſtructions of that Kind be taken out, and by that Means not only do the Work more effectually, but ſave a very great Expence by getting rid of the Water, which would otherwiſe annoy the Work. A ſecond Conſideration is, that if the Works are carried on according to the Plan laid down by the Act, it will be neceſſary to turn the Waters, during the Time the Works are executing, over the Fens and low Grounds, which will drown them of courſe; and as theſe Works cannot be executed under three or four Years, the Loſs of the Herbage, though but of a rough Nature, will be very conſiderable to the Proprietors, beſides damaging the Lands; but if the Plan here recommended be adopted, the middle River will be carrying off the Water during the whole Time of Execution, and the Navigation be open for the Paſſage of Boats, &c. which in the other Caſe muſt be entirely ſtopped. The next Thing to be conſidered, is the Milling the Water out of the River before the Workmen can begin to take out the Earth, and during the Time of their continuing ſo to do, this will be attended with no inconſiderable Expence, which will in a great Meaſure be ſaved by adopting the other Plan, eſpecially if the Works are executed at a proper Seaſon of the Year, together with all the Expence of ſtriking Dams, and making other Works to prevent the Waters from breaking in upon the Workmen.

If at any Time the Water in the middle River ſhould over ride the Drains at the Junction, and thereby prevent the low Lands from Draining, which may at ſome particular high Floods be the Caſe, I would not only recommend Pointing Doors to be fixed at each End of the ſide Drains, to prevent the high Land Waters from reverting up the ſame; but the Staunch in the middle River to be formed of Doors to ſwing upon a centre Pin, with a Lever or Ballance, that a Man may either ſhut or open them by ſetting the ſame edgeways againſt the Current, in the leaſt Time imaginable, by which Means the middle River may be either ſtopped or let run at pleaſure, and if it be ſtopped a ſhort Time only every Day, the Water on the lower Side will immediately ſettle and give the ſaid Drains an Opportunity of diſcharging their Contents, and theſe Drains and River may be run alternately at pleaſure; this may be of infinite Service at particular Times to all the low Lands between *Chappel Hill* and *Lincoln*.

That the Plan here recommended is practicable, and will be attended with the ſalutary Effects before mentioned, can be proved by Experience, which far exceeds the Opinion of the ableſt Engineer, for all the Demonſtration and Arguments that can be made uſe of, none are ſo ſatisfactory and explanatory as Experiment, and for this I ſhall refer the Gentlemen intereſted, to view *Holland* low Fen, and the low Lands adjoining thereto, which are drained upon the Principles here recommended, in Times of Floods they will there ſee one of the fineſt Tracts of low Lands in this Kingdom, abounding with Corn, Cattle, and Inhabitants, while other Lands that might be equally as well drained, by adopting the ſame Principles, are drowned for the greateſt Part of the Year.

*Boſton* Haven is now ſo effectually ſcoured out by the collecting and uniting the living Waters, that it is become good, and will be an improving and laſting Outfall, which ſeemed to be the only Thing doubted of at the ſetting out of the Plan for Draining this Country.

The Plan above recommended, is not only adopted to drain the low Lands in Queſtion, but the ſame Principles will ſerve to drain moſt, if not all the Fens and low Grounds in *England*, for there are but few, if any, in this Kingdom, but what have a Fall to the Sea, and that Fall is the ſame in Winter as in Summer; the Reaſon of all ſuch Lands being drowned, is becauſe the Waters coming from an extenſive high Country, either immediately break out of their Bounds for want of ſubſtantial Banks to confine them in their Channels, or that they riſe too high, and over ride the Soakage and Downfall Waters at the Places where ſuch Waters are intended to drain into the Rivers which bring down ſuch high Land Waters, or that the Drains are ſuffered gradually to go to decay for want of the neceſſary ſcouring and cleanſing, or ſome other Neglect or Miſmanagement.

I beg Leave alſo to recommend, that whether it is thought proper to adopt the above Plan and apply to Parliament for the ceſſary Amendments in the Act, or that the Commiſſioners proceed upon the Plan laid down by the preſent Act. That they begin at the lower End, and proceed regularly upwards, and finiſh ſubſtantially as they go on, and that as ſpeedily as poſſible; for it is certain, that temporary Works will never anſwer in this low Country; which the Works done on *Billinghay Skirth*, and the River *Witham* above *Dogdike*, and others that were executed in the ſame Manner, are ſufficient to convince any Gentlemen that have ſeen them, as they are almoſt all waſhed as level as they were before they were made, and therefore the Money is almoſt all ſunk, although they coſt upwards of Three Thouſand Pounds executing. Whereas if thoſe Works had been finiſhed ſubſtantially in due Time, this Money would all have been ſaved; but above all, I would recommend all Works for the future to be done at a proper Seaſon of the Year, and by ſo doing, there will be a great ſaving in the Expence; for it frequently happens, that by omitting to make up a Bank, or repairing ſome ſmall Breach at a proper Seaſon, when ſuch Accident happens, a great Part of the Bank is waſhed away, the Lands drowned, and no Materials can be come at that are proper to ſecure the Breach, without a very great Expence, and it is the ſame in making new Works, if they are executed when the Country is drowned, or in a wet Seaſon; the Way to do Works of this Kind well and cheap, is to do them when the Country is dry; although the Expences attending theſe and ſuch like Undertakings, will always be very conſiderable, even when the moſt frugal Means are taken, but where there are ſuch vaſt Advantages to be reaped, as in the preſent Caſe, the one will bear no Proportion to the other; and as the Money will all be expended in the Country near where the Works are to be executed, it will ſoon circulate through the ſame Hands again, and is no more than keeping the induſtrious Part of mankind employed in the Improvement of a Country, and increaſing Suſtenance of their Fellow Creatures. What I have here drawn up, has been at the Requeſt of ſome Gentlemen, in order if poſſible, to get ſomething done to relieve the preſent diſtreſſed Situation of the Country lying between *Chappel Hill* and *Lincoln*, and to prevent the Works already executed from going any farther to decay; I can with Confidence ſay, that I have recommended this Plan as the moſt eligible, and have pointed out all the Works which I conceive ought to be done at the general Charge, and am fully ſatisfied, that upon a due Conſideration, the Gentlemen will find the Principles here laid down, to be juſt, and much better adapted for general Drainage, than the Plan laid down by the Act.

Here ends Mr. *Creaſſy's* Report.

| | £. | S. | D. |
|---|---|---|---|
| NB. If this Plan is adopted, there will be wanted for the Brooks on the Eaſt Side the River *Witham*, Five Tunnels of ſeveral Dimenſions, which will amount to - - - - - | 1703 | 10 | 0 |
| There will be alſo wanted for the Brooks on the Weſt Side two Tunnels, which will amount to | 1733 | 15 | 0 |
| | £3437 | 5 | 0 |

And if the collateral Drains above recommended, are executed, they will take up 1428 Acres 1 Rood and 20 Perches of Land on the Sides of the River and Brooks.

What follows now, are my Obſervations upon ſome Part of it.

Having collected ſuch Parts of Mr. *Creaſſy's* Report as ſeems to fall under my Conſideration, I ſhall now proceed to make Obſervations on ſuch Parts of it as I apprehend may be varied to effect the Purpoſes of a good Drainage; Mr. *Creaſſy's* Scheme of Drainage, which may be ſeen in this Report, Folio 6th. and 7th. in which I agree that ſeveral of the Methods he has there pointed out, are clearly right.

But as to the parallel or ſide Drains emptying themſelves into the River at *Chappel Hill*, I confeſs I have ſome Doubt about; there may be Seaſons, according to my Idea of the Matter, when the parallel or collateral Drains may not be able to run any Water, for ſome Time together, which would be found very inconvenient and diſagreeable; as this appears to me a Thing which may frequently happen, I am much afraid that the Draining into the River at *Chappel Hill*, will be too doubtful a Place to rely upon when the Water in the River is in a midling State, which I was informed it was when I ſaw it, it being juſt then upon the Forelands there. And as there appears (by Mr. *Grundy's* Levels upon the Plan in the Town-Hall at *Boſton*) to be two Feet and one Inch Riſe from the Surface of the Land at *Chappel Hill* to the Surface of the Land at *Billinghay Skirth*, which I apprehend is too little Riſe to expect that a tolerable Drainage can be had to that Point. I agree that if two Feet Fall could be had at moſt Times, it might be ventured upon, but as that will not be the Caſe, according to my Idea of the Matter, it will not be prudent to rely totally thereon.

In Folio 8 of this Report, There is the Copy of an Article from Mr. *Creaſſy's,* wherein he ſays, In the firſt Place the low Lands will be rendered dry, by carrying the Soakage and Downfall Waters to a lower Part of the Outfall, in ſeparate and independant Channels, as they will be thereby diſcharging at the ſame Time the Flood Waters are running off. I apprehend that cannot altogether be ſo, or even that it appears to me there are ſufficient Facts to occaſion me to believe, that the ſide Drains can deliver their Water into the River at *Chappel Hill,* ſo as to enable the Country lying between *Chappel Hill* and *Lincoln,* on both Sides the River, to be made dry and uſeful in all common Times of Floods.

There is another Expedient in Folio 11 of this Report, (copied from Mr. *Creaſſy's)* which ſays, that Pointing Doors or Gates ſhould be placed at the lower End of each parallel Drain, to prevent the high Land Waters from reverting up the ſame; that the Staunch in the middle River is to be formed of Doors to turn upon a center pin, that may be opened or ſhut at pleaſure, to ſtop the whole River until the Water in the parallel Drains can be diſcharged. How far this Propoſal might anſwer, is what cannot at preſent be determined. The Times when this Staunch would be moſt wanted, muſt be in high Waters or Floods. and I think no one can take upon him to ſay poſitively how long it will require thoſe Gates to be ſhut in twenty-four Hours, at ſuch a Time, to give ſufficient Time for the Drains to empty themſelves into the *Witham*; or can any one, in my Opinion, determine whether the Flood Waters would permit the Staunch to be ſhut at all at thoſe Times, without the Banks above being expoſed to very great Danger.

There are alſo other Things in favour of the ſide Drains emptying themſelves at *Chappel Hill*, that when the Sides of the River are embanked all the Way from thence to *Lincoln*, the Declivity from *Lincoln* to the Sea Sluice at *Boſton* will be altered, and nearly alike through the whole River; at preſent the Water overſpreads the Country in ſuch a Manner, for want of ſufficient Banks, that it muſt tend to that Place, as being a lower Part of the Country, and remain there until it can be diſcharged through the Sea Sluice at *Boſton*.

There is alſo another Advantage in favour of the Water in the collateral or parallel Drains emptying themſelves into the River at *Chappel Hill*, that when the Clay Reaches in the New River are made wider and deeper, the Water will fall out at low Water ſomething more than it does in its preſent State, but how much I do not pretend to account for.

I can with great Confidence ſay, that if the Levels taken by Mr. *Grundy* are right, (which I have no Doubt about) there may be a compleat Drainage made from *Lincoln*, on both Sides the River *Witham*, to *Chappel Hill*; the Weſt Side Waters to be carried under the River by a ſubterraneous Paſſage or ſunken Tunnel, to the Eaſt Side, at or near that Place, and to unite together on this Side, and be conveyed to *Langrick-Ferry* in one Channel, where there will be a ſufficient Fall into the River *Witham*; for as the Water was on the Eleventh Day of *January*, 1776, being in a middling State in the River, there was eight Feet one Inch and three-tenths Fall from the Surface of the Land at *Billinghay Skirth*, to the Surface of the Water after the Side, at *Langrick-Ferry*, which will be one Foot one

Inch and three-tenths more than will be wanted to empty the collateral Drains to the Bottom at *Billinghay Skirth*, at ſuch a Seaſon as this.

Hence follows the Eſtimate, where I have taken it for certain that the Lengths of the ſeveral Articles therein mentioned, are meaſured right.

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# An ESTIMATE of the Expence of compleating the ſeveral General Works of DRAINAGE, from the Town of BOSTON to the City of LINCOLN.

To taking down the Forelands in a Clay Reach a little above *Anthony's Gowt*, twenty Feet wide at the Top, ten Feet wide at the Bottom, and ſeven Feet deep.

| | Feet | In. | | £. | S. | D. |
|---|---|---|---|---|---|---|
| Length | 3700 | 0 | 971¼ Floors, at 3*s.* 9*d.* per Floor - - - - | 182 | 2 | 2 |
| Depth | 7 | 0 | | | | |
| Width | 15 | 0 | | | | |
| The ſame Sum for the other Side - - | | | | 182 | 2 | 2 |

To taking down the Forelands from a Place called the *Round Houſe*, to the Junction of *Kyme Eau* with the River *Witham*, by the ſame Dimenſions of Breadth and Depth as above.

| | Feet | In. | | £. | S. | D. |
|---|---|---|---|---|---|---|
| Length | 10560 | 0 | 2772 Floors, at 3*s.* 9*d.* per Floor - - - - | 519 | 15 | 0 |
| Depth | 7 | 0 | | | | |
| Width | 15 | 0 | | | | |
| The ſame Sum for the other Side - - | | | | 519 | 15 | 0 |

To cutting two Drains, one on each Side the River *Witham*, and parallel to the ſame, from the

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Junction of *Kyme Eau* to *Billinghay Skirth*, to be thirty Feet wide in the Top, ten Feet wide at the Bottom, and ſeven Feet deep.

| | Feet | In. | | £. | S. | D. |
|---|---|---|---|---|---|---|
| Length | 11040 | 0 | 3864 Floors, at 3*s*. 9*d*. per Floor - - - | 724 | 10 | 0 |
| Depth | 7 | 0 | | | | |
| Width | 20 | 0 | | | | |
| The ſame Sum for the other Side - - | | | | 724 | 10 | 0 |

To cutting two ſide Drains, of the ſame Breadth and Depth as the laſt mentioned ones, parallel to the River *Witham*, from *Billinghay Skirth* to *Kirkſtead Lock*, and barrow the whole of the Earth upon the River Banks.

| | Feet | In. | | £. | S. | D. |
|---|---|---|---|---|---|---|
| Length | 11220 | 0 | 3927 Floors, at 3*s*. 9*d*. per Floor - - - | 736 | 15 | 3 |
| Depth | 7 | 0 | | | | |
| Width | 20 | 0 | | | | |
| The ſame Sum for the other Side - - | | | | 736 | 15 | 3 |

To cutting two ſide Drains, of the ſame Dimenſions as the laſt mentioned ones, and parallel to the River *Witham*, from *Kirkſtead Lock* to *Duns-Dike*, and form the Earth ariſing therefrom into Banks.

| | Feet | In. | | £. | S. | D. |
|---|---|---|---|---|---|---|
| Length | 24560 | 0 | 8596 Floors, at 3*s*. 9*d*. per Floor - - - | 1611 | 15 | 0 |
| Depth | 7 | 0 | | | | |
| Width | 20 | 0 | | | | |
| The ſame Sum for the other Side. - - | | | | 1611 | 15 | 0 |
| | | | | £6146 | 0 | 6 |

To cutting two ſide Drains, of the ſame Dimenſions as the above mentioned ones are to be, from *Duns-Dike* to eighteen Chains above *Bardney* Landing Place, and form the Earth into Banks.

| | Feet | In. | | £. | S. | D. |
|---|---|---|---|---|---|---|
| Length | 21120 | 0 | 7392 Floors, at 3*s.* 9*d.* per Floor - - - | 1386 | 0 | 0 |
| Depth | 7 | 0 | | | | |
| Width | 20 | 0 | | | | |

The ſame Sum for the other Side - - 1386 0 0

To extra Work on the North Side at *Bardney* Landing Place - - - - - 50 0 0

To cutting two ſide Drains, of the ſame Dimenſions as the above mentioned ones are to be, from eighteen Chains above *Bardney* Landing Place, to the Junction of *Barling's Eau*, and form the Earth into Banks.

| | Feet | In. | | £. | S. | D. |
|---|---|---|---|---|---|---|
| Length | 8660 | 0 | 3031 Floors, at 3*s.* 3*d.* per Floor - - - | 492 | 10 | 9 |
| Depth | 7 | 0 | | | | |
| Width | 20 | 0 | | | | |

The ſame Sum for the other Side - - 492 10 9

To cutting two ſide Drains, the ſame Dimenſions as the above mentioned ones are to be, from *Barling's Eau* to *Fiſkerton* Town Dike, and form the Earth into Banks.

£3807 1 6

| | Feet | In. | | £. | S. | D. |
|---|---|---|---|---|---|---|
| Length | 17820 | 0 | 6237 Floors, at 3*s.* 6*d.* per Floor - - - | 1091 | 18 | 6 |
| Depth | 7 | 0 | | | | |
| Width | 20 | 0 | | | | |

The ſame Sum for the other Side - - 1091 18 6

To extra Work filling up *Fiſkerton* Town Dike End - - - - - - - - 15 0 0

To cutting two ſide Drains, of the ſame Dimenſions as the above mentioned ones are to be, from *Fiſkerton* Town Dike to *Waſhingborough* Ferry, and form the Earth into Banks.

| | Feet | In. | | | | |
|---|---|---|---|---|---|---|
| Length | 11220 | 0 | 3927 Floors, at 3*s.* 6*d.* per Floor - - - | 687 | 4 | 6 |
| Depth | 7 | 0 | | | | |
| Width | 20 | 0 | | | | |

The ſame Sum for the other Side - - 687 4 6

To a farther Allowance to carry both Banks round a Bog in the laſt mentioned Reach - 200 0 0

To cutting two ſide Drains, one on each Side the River *Witham*, from *Waſhingborough* Ferry to *Lincoln* Lock; to be twenty Feet wide at the Top, eight Feet wide at the Bottom, and five Feet deep, and form the Earth into Banks.

£3773 6 0

| | Feet | In. | | £. | S. | D. |
|---|---|---|---|---|---|---|
| Length | 10560 | 0 | 1848 Floors, at *2s. 9d.* per Floor - - - | 254 | 2 | 0 |
| Depth | 5 | 0 | | | | |
| Width | 14 | 0 | | | | |

The Sides of the River to be taken off from the above Ferry to *Lincoln* Lock, and formed into the above Banks.

| | Feet | In. | | | | |
|---|---|---|---|---|---|---|
| Length | 10560 | 0 | 792 Floors, at *2s. 9d.* per Floor - - - | 108 | 18 | 0 |
| Depth | 3 | 0 | | | | |
| Width | 10 | 0 | | | | |

| | | | |
|---|---|---|---|
| The ſame Sum for the other Side - - | 363 | 0 | 0 |
| To filling up Dike Ends, clearing away the Wood, laying temporary Tunnels under the ſide Drains to drain the Works during the Time the ſame are executing, and other Work - - | 500 | 0 | 0 |

To raiſe two Banks by the Side of *Billinghay Skirth*, from the River *Witham* to the Beginning of *North Kyme* Fen, to have three and a half Floors taken out from the back or parallel Drain, and three and a half Floors from the Foreland or Foreſhore; Dimenſions of the Drain as follows,

| | Feet | In. | | | | |
|---|---|---|---|---|---|---|
| Length | 9900 | 0 | 1732½ Floors, at *3s. 3d.* per Floor - - - | 281 | 10 | 7½ |
| Depth | 5 | 0 | | | | |
| Width | 14 | 0 | | | | |
| | | | | £1507 | 10 | 7½ |

Dimenſions of Earth to be taken from the Foreland

| | Feet | In. | | £. | S. | D. |
|---|---|---|---|---|---|---|
| Length | 9900 | 0 | 1732½ Floors, at 3*s*. 3*d*. per Floor - - - | 281 | 10 | 7½ |
| Depth | 2 | 6 | | | | |
| Width | 28 | 0 | | | | |

The ſame Sum for the other Side - - 563 1 3

To make a Bank from *North Kyme* Fen, along the *Skirth* to the *Car Dike* on *Billinghay* Fen Side; the Dimenſions of the Drain as follows,

| | Feet | In. | | | | |
|---|---|---|---|---|---|---|
| Length | 4260 | 0 | 745½ Floors, at 3*s*. 3*d*. per Floor - - - | 121 | 2 | 10½ |
| Depth | 5 | 0 | | | | |
| Width | 14 | 0 | | | | |

Dimenſions of the Earth to be taken from the Foreland

| | Feet | In. | | | | |
|---|---|---|---|---|---|---|
| Length | 4260 | 0 | 745½ Floors, at 3*s*. 3*d*. per Floor - - - | 121 | 2 | 10½ |
| Depth | 2 | 6 | | | | |
| Width | 28 | 0 | | | | |

To repair the South Bank of the *Skirth*, from *Car Dike* to *Kyme* Cauſeway Bridge, will take two Floors and a half in a Rod, and there is 345 Rods, containing 862½ Floors, at 3*s*. 3*d*. per Floor - 140 3 1½

To repair the Banks of the other Branch of *Billinghay Skirth*, up to the Junction of *Scopwick Beck*

£1227 0 9

| | £. | S. | D. |
|---|---|---|---|
| with *North Kyme* Fen Dike, will take four Floors in a Rod, 165 Rods contains 660 Floors, at 3*s*. 3*d*. per Floor - - - - - - - | 107 | 5 | 0 |
| To ſcour out the *Car Dike* from *Billinghay Skirth*, one hundred Rods in Length upwards, to take out four Floors in a Rod, the Earth to be all laid on the Fen Side, will contain 400 Floors, at 4*s*. 6*d*. per Floor - - - - - - | 90 | 0 | 0 |
| To ſcour out the *Car Dike* from *Billinghay* Lordſhip, ſeven hundred and ninety-two Rods in Length upwards, which will reach a little above *Timberland Thorpe*, to take out three Floors in a Rod at an Average, and apply the ſame to the Bank on the Fen Side, will contain 2376 Floors, at 3*s*. 6*d*. per Floor | 415 | 16 | 0 |
| To ſcour out the *Car Dike* from the laſt mentioned Place, to a Place where the Banks are waſhed down in *Metheringham* Fen, being 1322 Rods, to take out two Floors in a Rod at an Average, and apply the ſame in repairing the Bank on the Fen Side, 2644 Floors, at 4*s*. per Floor - - | 528 | 16 | 0 |
| To extra Work in clearing away the Wood, &c. | 120 | 0 | 0 |
| To repair the broken Bank in *Metheringham* Lordſhip, thirty-three Rods in a Length, at ſeven | | | |
| | £1261 | 17 | 0 |

| | £. | S. | D. |
|---|---|---|---|
| Floors in a Rod, contains 231 Floors, at 3*s*. 6*d*. per Floor - - - - - | 40 | 8 | 6 |
| To ſcour out the *Car Dike* from the laſt mentioned Place to *Duns Dike*, to take out two Floors in a Rod, 118 Rods contains 236 Floors, at 3*s*. 6*d*. per Floor - - - - - - | 41 | 6 | 0 |
| To repair a low Place in the Bank from *Duns Dike* to the Wood by *Dunſtan Beck*, will take four Floors in a Rod, 56 Rods in Length will contain 224 Floors, at 4*s*. 6*d*. per Floor - - | 50 | 8 | 0 |
| To ſcour out the *Car Dike*, and repair the Bank on the Fen Side from the laſt mentioned Place, 264 Rods upwards, to take out three Floors at a Medium in a Rod, 792 Floors, at 4*s*. 6*d*. per Floor | 178 | 4 | 0 |
| To extra Work in clearing the Wood, &c. - | 30 | 0 | 0 |
| To ſcour out the *Car Dike* to *Nocton Dike* End, to take out two Floors in a Rod, 66 Rods in Length, contains 132 Floors, at 4*s*. 6*d*. per Floor - | 29 | 14 | 0 |
| To ſcour out and repair the Bank of the *Car Dike* from the laſt mentioned Place to *Waſhingborough Beck*, to take out four Floors in a Rod at an Average, 1270 Rods contains 5080 Floors, at 3*s*. 6*d*. per Floor - - - - - - - | 889 | 0 | 0 |
| | £1259 | 0 | 6 |

| | £. | S. | D. |
|---|---|---|---|
| To extra Work in clearing away the Fences, &c. | 50 | 0 | 0 |
| Returned back from *Waſhingborough* Beck, and beginning at *Tatterſhall* Bane.----To make a Bank on the South-eaſt Side of *Tatterſhall* Bane, from the River *Witham* to *Tatterſhall* Bridge, five Feet high at a Medium, to caſt part of the Earth from the Side of the ſaid Bane, and part out of a ſide Drain, will take three and a half Floors in a Rod, 424 Rods contains 1484 Floors of caſting Work, at 2*s.* 9*d.* per Floor - - - - | 204 | 1 | 0 |
| To extra Work in filling up Dike Ends - | 20 | 0 | 0 |
| To embank *Stickſwould* Beck from the River *Witham* to a Brick Bridge over the Beck above, each Bank to have ſix Floors of Earth in a Rod at an Average, 358 Rods contains 2148 Floors of caſting Work, part of the Earth to be had from the River Side, and part from the ſide Drains, at 2*s.* 9*d.* per Floor - - - - - | 295 | 7 | 0 |
| The ſame Sum for the other Side - - | 295 | 7 | 0 |
| To embank the above Beck from the Brick Bridge up to the high Lands, each Bank to have four Floors in a Rod, 132 Rods contains 528 Floors, at 2*s.* 9*d.* per Floor - - - - - - | 72 | 12 | 0 |
| The ſame Sum for the other Side - - | 72 | 12 | 0 |
| | £1009 | 19 | 0 |

| | £. | S. | D. |
|---|---|---|---|
| To turn *Bucknal* Beck out of its preſent Courſe, to join *Stickſwould* Beck, (which Mr. *Creaſſy* ſays, will ſave ſix hundred and ninety-three Pounds embanking) to be done by a new Cut, and forming the Earth into Banks on each Side, to take out ſix Floors in a Rod, 264 Rods in Length, contains 1584 Floors of caſting Work, at 2*s.* 9*d.* per Floor | 217 | 16 | 0 |
| The ſame Sum for the other Side - - | 217 | 16 | 0 |
| To embank *Southery Eau* from the River *Witham* to *Tupholm Dike*, each Bank to be of the ſame Dimenſions as the Banks of the *Witham*, will take ſeven Floors in a Rod, 330 Rods contains 2310 Floors, part caſt from the Sides of the Eau, and part from cutting the ſide Drains, at 2*s.* 9*d.* per Floor - | 317 | 12 | 6 |
| The ſame Sum for the other Side - - | 317 | 12 | 6 |
| To embank the above *Southery Eau* from *Tupholm Dike* End to the high Lands, each Bank will take four Floors in a Rod, 264 Rods contains 1056 Floors of caſting Work, the Earth to be taken as above mentioned, at 2*s.* 9*d.* per Floor - - - | 145 | 4 | 0 |
| The ſame Sum for the other Side - - | 145 | 4 | 0 |
| To embank *Tupholm Dike* from the River *Witham* to the high Lands, each Bank will take four and a | | | |
| | £1361 | 5 | 0 |

| | £. | S. | D. |
|---|---|---|---|
| half Floors in a Rod at an Average, 206 Rods in Length, contains 927 Floors of caſting Work of Gravel, part of the Earth to be taken from the Beck Side, and part from the ſide Drain, at 3*s*. 3*d*. per Floor - - - - - - - | 150 | 12 | 9 |
| The ſame Sum for the other Side - - | 150 | 12 | 9 |
| To embank *Bardney Beck* in the ſame Manner as the aforeſaid Becks are intended, each Bank will take five Floors of Earth at an Average in a Rod, 330 Rods in Length, will contain 1650 Floors, at 2*s*. 9*d*. per Floor - - - | 226 | 17 | 6 |
| The ſame Sum for the other Side. - - | 226 | 17 | 6 |
| To embank *Barling's Eau* from the River *Witham* in the ſame Manner as before mentioned, 264 Rods in Length, each Bank will take ſeven Floors in a Rod, which will contain 1848 Floors in one Side, at 3*s*. 6*d*. per Floor - - - - - - | 323 | 8 | 0 |
| The ſame Sum for the other Side - - | 323 | 8 | 0 |
| To embank *Barling's Eau* forward up the Country to the *Abby*, each Bank will take five Floors in a Rod, 200 Rods in Length, will contain 1000 Floors, at 3*s*. 6*d*. per Floor - - - - | 175 | 0 | 0 |
| The ſame Sum for the other Side - - | 175 | 0 | 0 |
| | £1751 | 16 | 6 |

| | £. | S. | D. |
|---|---|---|---|
| To embank *Stainfield Beck* in the ſame Manner as before mentioned, will take five Floors in a Rod, 132 Rods will contain 660 Floors, at 2*s*. 9*d*. per Floor - - - - - - - | 90 | 15 | 0 |
| The ſame Sum for the other Side - - | 90 | 15 | 0 |
| To embank *Bullington Beck* in the ſame Manner as before mentioned, will take five Floors in a Rod in Length, 132 Rods will contain 660 Floors, at 2*s*. 9*d*. per Floor - - - - - - | 90 | 15 | 0 |
| The ſame Sum for the other Side - - | 90 | 15 | 0 |
| Suppoſing the *Sleaford* Navigation ſhould not go forward, there will be the other Side of *Kyme Eau* to embank and ſcour out. | | | |
| To embanking *Kyme Eau* on one Side, from the River *Witham* to *Drury Dike* End, 310 Rods in Length, at ſeven Floors in a Rod, will contain 2170 Floors, at 3*s*. 9*d*. per Floor - - | 406 | 17 | 6 |
| To ſcour out and deepen *Kyme Eau* from *Ewerby* Claps to the high Lands, 449 Rods in Length, at three Floors in a Rod, will contain 1347 Floors, at 3*s*. 3*d*. per Floor - - - - - - | 218 | 17 | 9 |
| To taking off the Water whilſt the above Work is in Hand - - - - - - - - | 30 | 0 | 0 |
| | £1018 | 15 | 3 |

## Totals of the Folio's in this ESTIMATE.

| No. | £. | S. | D. |
|---|---|---|---|
| 19 - - - - | 1403 | 14 | 4 |
| 20 - - - - | 6146 | 0 | 6 |
| 21 - - - - | 3807 | 1 | 6 |
| 22 - - - - | 3773 | 6 | 0 |
| 23 - - - - | 1507 | 10 | 7½ |
| 24 - - - - | 1227 | 0 | 9 |
| 25 - - - - | 1261 | 17 | 0 |
| 26 - - - - | 1259 | 0 | 6 |
| 27 - - - - | 1009 | 19 | 0 |
| 28 - - - - | 1361 | 5 | 0 |
| 29 - - - - | 1751 | 16 | 6 |
| 30 - - - - | 1018 | 15 | 3 |
| To incidental Expences at 10£. per Cent. | 2495 | 0 | 0 |
| Total. | £28022 | 6 | 11½ |

**There is no Charge in this Eſtimate for the Lands that will be uſed in performing the Work.**

**BOSTON,** **JOHN SMITH,**
***January* 18th. 1776.** **ENGINEER.**

## An ESTIMATE of the Expence of bringing the Water of the parallel Drains from *Chappel Hill* to *Langrick Ferry*.

To Digging the Drain,

| | Feet | In. | | £. | S. | D. |
|---|---|---|---|---|---|---|
| Length | 28250 | 0 | 19775 Floors, at 4*s.* 3*d.* per Floor - - - | 4202 | 3 | 9 |
| Depth | 7 | 0 | | | | |
| Width | 40 | 0 | | | | |

Dimenſions of the Drain.

To be fifty-two Feet wide at the Top, twenty-eight Feet wide at Bottom, and ſeven Feet deep.

| | £. | S. | D. |
|---|---|---|---|
| The Total on the other Folio brought over - | 28022 | 6 | 11½ |
| Total. | £32224 | 10 | 8½ |

There is nothing charged for Land in this Eſtimate.

BOSTON,
*January* 18th. 1776.

JOHN SMITH,
ENGINEER.

Mr. *Creaſſy* and myſelf are of one united Opinion, that if the Outfall of the collateral Drains is carried down to *Langrick Ferry*, we are certain the Country muſt be drained as well as is poſſible; but we both recommend that the collateral Drains be tried firſt to *Chappel Hill*, and if ſufficient Fall is not obtained when the Embankments are made, and the Clay Reaches in the New River ſcoured out, that we both of us then adviſe that it be carried down to the Ferry above mentioned, where we are ſatiſfied the Fall is ſuch to that Place, that it cannot fail of anſwering the deſired End.

BOSTON,
*January* 18th. 1776.

*John Smith*
*James Creaſſy* } Engineers.

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